18. Seabirds

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Background and Estimation Approaches

Marine birds are represented by 20 species in the Northeast U.S. Continental Shelf Ecosystem and are moderately abundant, especially on Georges Bank (Schneider and Heinemann 1996). There have been no large scale surveys of marine bird populations conducted in the region since 1988. The region is generally thought of as a seasonal feeding area with few species actually nesting locally. Eleven species were chosen as important offshore predators to include in the energy budgets of the four EMAX ecoregions (Table 18.1).

Schneider and Heinemann (1996) provide the mean and standard deviation for various seabirds during 1978-1988 as well as abundance data (deviations for the mean) for the same period. Since no current seasonal abundance data are available for the region, the information for quarterly abundance during 1978-1980 in Powers (1983; Appendix 5 in that publication) was used. These data were standardized to the highest quarterly value and used with the mean, standard deviation, and yearly deviation for each species to calculate quarterly numbers of birds during 1978-1988, assuming that the seasonal distribution of seabirds has not changed over time. Since the three species of shearwaters are similar in size and greater shearwaters are by far the most abundant, their abundance was combined.

The proportion of seabirds in each ecoregion was calculated from seasonal and regional abundance data provided in Powers (1983; Appendix 1 in that publication). Quarterly abundance by region was summed and divided by the total abundance in all regions for that species. Since there are no estimates of abundance for the 1996-2000 period, the average abundance during 1984-1988 was calculated for each quarter and converted to biomass with estimates of average species specific weight from Powers and Bachus (1987). Quarterly biomass estimates were averaged and the proportions by region used to partition biomass into the four ecoregions (Table 18.2).

Production and Consumption

Consumption by seabirds was estimated from quarterly numbers of birds and estimates of daily ration (kg day^{-1}) from an energetics equation (Innes 1987). The daily consumption by each species was estimated and expanded to a quarterly basis (91.5 days). Quarterly consumption was summed and a yearly average was calculated (Table 18.3). Production was estimated with a P:B ratio (0.275) obtained from Savonkoff *et al.* (2004) and applied to the average biomass. Quarterly estimates were summed and averaged for the year (Table 18.3). Results for all species were summed and apportioned into each ecoregion (Table 18.4)

References

Powers, K.D. 1983. Pelagic distributions of marine birds off the Northeastern United States. U.S. Department of Commerce. NOAA Technical Memorandum NMFS-F/NEC-27. 201 pp.

Powers, K.D., and E.H. Bachus. 1987. Energy transfer to birds. In R.H. Backus and D. W. Bourne (eds), Georges Bank, Cambridge, MA: MIT Press, pp. 372-375.

Schneider, D.C., and D.W. Heinemann. 1996. The state of marine bird populations from Cape Hatteras to the Gulf of Maine. Chapter 11 in K. Sherman, N.A. Jaworski, and T.J. Smayda (eds), The Northeast Shelf Ecosystem Assessment, Sustainability, and Management. Blackwell Science, Cambridge, MA, pp. 197-216.

Table 18.1. Marine birds included in energy budget calculations for the four ecoregions on the Northeast U.S. Continental Shelf Ecosystem.

Greater shearwater (*Puffinus gravis*)
Sooty shearwater (*Puffinus griseus*)
Cory's shearwater (*Calonectris diomedae*)
Northern gannet (*Sula bassanus*)
Black-legged kittiwake (*Rissa triactyla*)
Great black-backed gull (*Larus marinus*)
Herring gull (*Larus argentatus*)
Northern fulmar (*Fulmarus glacialis*)
Wilson's storm petrel (*Oceanites oceanicus*)
Red phalarope (*Phalaropus fulicarius*)
Laughing gull (*Larus philadelphia*)

Table 18.2. Example calculation for biomass of Northern gannet by yearly quarter and region.

Northern Gannet	Quarter				
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec	Average
Average N (1984-1988)	219,064	238,623	1,304	113,444	143,109
Average Biomass (1984-1988) (mt)	657.2	715.9	3.9	340.3	429.4

	EMAX Regions			
	GOM	GB	SNE	MAB
Proportion of Total Study Area	0.125	0.227	0.361	0.287
Average Biomass by Region (mt)	53.7	97.4	155	123.2

Table 18.3. Quarterly consumption and average consumption and production for northern gannet during 1996-2000.

Northern Gannet	Quarter			
	Jan-Mar	Apr-Jun	Jul-Sep	Oct-Dec
Quarterly C (1996-2000) (mt)	5921.145	6449.819	35.24491	3066.307
Average Quarterly C	3868.129			
Quarterly P (1996-2000) (mt)	180.7277	196.8641	1.07576	93.59112
Average Quarterly P	118.0647			

Table 18.4. Average biomass (B), consumption (C), and production (P) (g m^{-2} yr^{-1}) for seabirds by ecoregion during 1996-2000.

Area	B	C	P
GOM	0.005878	0.063031	0.001616
GB	0.014393	0.15652	0.003958
SNE	0.006334	0.064728	0.001742
MA	0.003634	0.03691	0.000999